Future Agricultures

Working Paper

Repeated Access and Impacts of the Farm Input Subsidy Programme in Malawi: Any Prospects of Graduation?

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Abstract:

This paper analyses the impacts of the Farm Input Subsidy Programme (FISP) using a balanced four-year panel of 461 households from 2004/5, 2006/7, 2008/9 and 2010/11 agricultural seasons. We find evidence of economy wide and input market effects of the subsidy programme. The economy-wide effects of the subsidy programme are strong particularly due to lower maize prices and increased *ganyu* wage rates. The economy-wide effects of the subsidy which arise from higher *ganyu* wage rates, reduced time spent on *ganyu*, availability of maize at local level and lower prices of maize have enabled poor households to access maize when they run out of their own production. With respect to input market effects, with 2010/11 conditions and quantities of subsidised fertiliser, a 1 percent increase in subsidised fertilisers reduces commercial demand by 0.15 – 0.21 percent. However, using various welfare indicators, we find mixed results on the direct beneficiary household effects of the subsidy programme from panel data analysis and there is no overwhelming evidence on the relationship between repeated access and impacts of the subsidy. The direct beneficiary impacts on food consumption, self-assessed poverty and overall welfare are weak and mixed while there is some statistically significant evidence of positive impacts on primary school enrolment, under-5 illness and shocks. Nonetheless, the impact analysis highlights the challenges of targeting and sharing of subsidy among households, which may have implications on the direct beneficiary impacts and prospects to sustainably graduate from the programme.

1.0 Introduction

This paper analyses the impact of Malawi's Farm Input Subsidy Programme (FISP, previously known as the Malawi Agricultural Input Subsidy Programme, MAISP) on selected indicators of household welfare. The 2010/11 season marked its sixth year of implementation and some households have had continuous access while others have had intermittent access to subsidised fertilisers. Although the main objective of the input subsidy is to increase productivity and food security, it plays multiple roles and has the potential to influence other social and economic indicators of well-being. Previous evaluations of the FISP have focused on a narrow range of impact indicators and the analysis has largely been based on cross-section data (SOAS et al, 2008; Dorward and Chirwa, 2010b). Furthermore, the analysis of impact of the subsidy programme on maize production and productivity has been marred by the difficulties in obtaining consistent data on area under maize cultivation and maize output based on recall methods and yield sub-plots (Dorward and Chirwa, 2010a). However, apart from productivity and maize production and self-assessment of poverty, there are other socio-economic indicators that can be influenced by the availability of food through the subsidy programme. These other indicators include food consumption, schooling and health and resilience to shocks and stresses.

SOAS et al (2008) and Dorward et al (2010) suggest various pathways through which a large-scale farm input subsidy programme affects different types of households, different markets and the economy. These effects are classified into effects on the macroeconomic environment (fiscal, monetary, growth and food price effects), effects on input markets (displacement and investments in input supply systems) and rural household impacts (direct beneficiary effects and rural economy-wide effects). SOAS et al (2008) present a framework for understanding the different direct and indirect impacts of input subsidies on different households in a rural economy, as presented in Figure 1. The effects on recipient households arise from the direct beneficiary impacts of the subsidy programme through increased production and incomes from sales of agricultural output, resale of coupons by poor households and displacement use by less poor households.

The other effects arise from economy-wide impacts owing to the scale of the programme through the price effects – reduced price of food and increase in wages. These economy-wide effects affect both recipients and non-recipient households in the rural economy. The economy-wide impacts can also affect the macroeconomic environment and promote economic growth. The increased incomes arising from direct beneficiary impacts and economy-wide impacts may stimulate further investments and diversification in farm and non-farm activities, with implications on the overall growth of the economy.

These various effects of the farm input subsidy programme depend on the implementation efficiency and the cost-effectiveness of the programme and the various shocks and stresses that households experience. At household level, the size of the benefits or subsidy package, the targeting of beneficiaries, the timing of access to the subsidy and access to extension services are critical in realising direct beneficiary benefits from the subsidy programme. SOAS et al (2008) and Dorward et al (2010) highlight specific issues that can affect the direct beneficiary impacts of the subsidy such as targeting (with the better off more likely to receive the subsidy), size of the benefits (with widespread redistribution of coupons within the village), improvements in the timing of receipts and limited access to extension advice on fertiliser and seed variety use. The input market and economy-wide impacts also depend on the efficiency and

Figure 1: Understanding household and local economy impacts of input subsidies

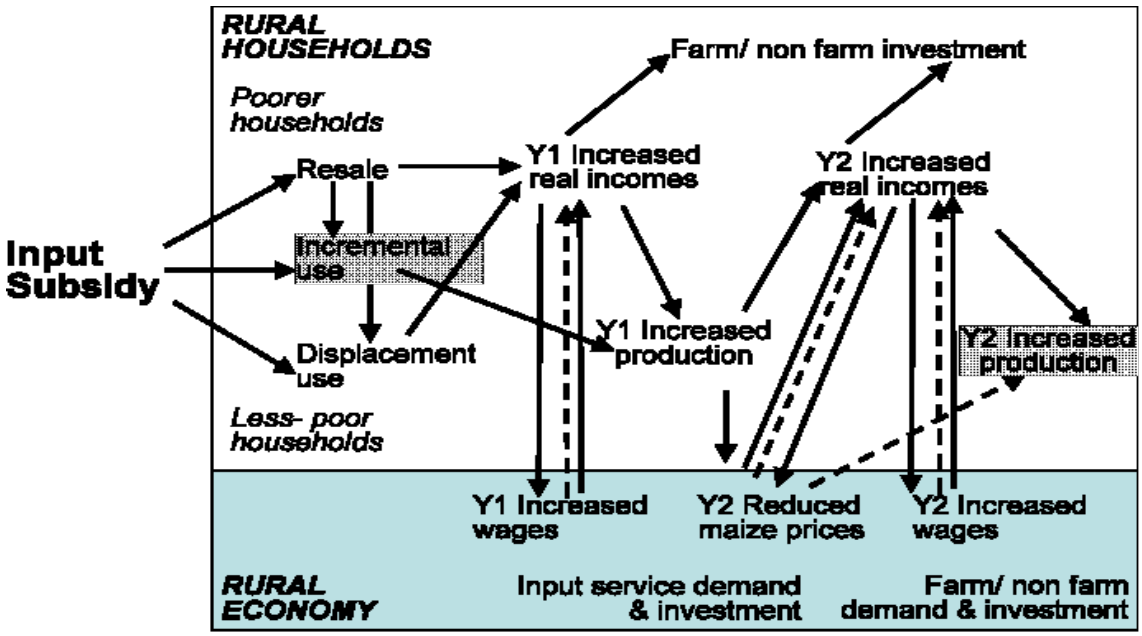


Figure 1 Understanding Household and Local Economy Impacts of Input Subsidies

cost effectiveness of the subsidy programme including scale of the programme, procurement, targeting and distribution of inputs. For instance, reduced maize prices and increased wage rates may kick-start growth in the rural economy while poor targeting may lead to displacement of commercial sales of farm inputs and exclusion of the private sector in the implementation of the subsidy programme may reduce private investment in input supply systems. SOAS et al (2008) and Ricker-Gilbert et al (2010) find evidence of displacement of commercial sales of fertilisers due to the subsidy programme.

This paper is organized into five sections. In the next section, we document the methodology for evaluating the impact of the subsidy programme on various socio-economic indicators. Section 3 analyses the impacts of subsidies on various indicators, including indicators of the economy-wide, input markets and direct beneficiary household effects of the subsidy programme. Section 4 focuses on the impact analysis, mainly based on the life stories from selected beneficiary households. Finally, we offer concluding remarks.

2.0 Methodology

2.1 Data sets

With the advantage of periodic evaluation of the subsidy programme, the design of the third Farm Input Subsidy Survey (FISS3) in 2011 incorporated questions that were also asked to the same households in the second Integrated Household Survey (IHS2) in 2004/05. This allows us to compare the same households, with and without subsidies since the 2005/06 season, and provides an opportunity to evaluate the impact of the subsidy programme on direct beneficiary households over time. We also use the Agricultural Input Subsidy Survey (AISS1) covering the 2006/07 season and AISS2 covering the 2008/09 season. This leads to a four-year panel data set covering 2004/05, 2006/07, 2008/09 and 2010/11 seasons. The FISS3 also tracked access to fertiliser subsidy since the programme started, and this has enabled us to control for the number of times the household has had access to fertiliser subsidies between the 2005/06 and 2010/11 seasons. Hence, we were able to investigate the impact of repeated access to the input subsidy programme on various socio-economic outcomes. The study also uses qualitative data from the FISS3 conducted between March and April 2011. In the qualitative approach, data was collected through 8 focus group discussions, 24 key informant interviews and life histories for 64 households representing vulnerable groups in 8 districts.

Table 1 presents the distribution of the sample by survey and number of times households have had access to fertiliser subsidy. It is helpful to identify three groups regarding households' subsidy receipt: a small proportion who never had access to subsidised fertiliser (no access), a much larger group who had access to subsidised fertiliser at least once and up to five times in six seasons (intermittent access), and those who had access to subsidised fertiliser six times (continuous access) from the 2005/06 to 2010/11 seasons. These groups accounted for 4%, 51% and 45% of households, respectively. Most of the households are, therefore, repeat beneficiaries[1]. In terms of headship of households in 2010/11, 66% and 34% of the sample households were male- and-female headed, respectively. The distribution of households by poverty status in IHS2 also shows that the overall sample had equal numbers of households that were poor and non-poor.

2.2 Methods of analysis

The analysis of the impact of the subsidy programme is categorized into three: economy-wide effects, input market effects and direct beneficiary household effects.

2.2.1 Economy-wide impacts

The analysis of economy-wide impacts is based on the trends of selected macroeconomic variables such as gross domestic product, agricultural output, general price levels and the fiscal balance; and household level data on maize prices and rural wages. In addition, the information from focus group interviews and key informants is used to

Table 1 Distribution of sample by panel and access to fertiliser subsidy

Number of seasons with access	Panel households		Headship, 2010/11 (%)		Poverty status in IHS2 (%)		Proportions of poor & non-poor (%)	
	N	%	Male	Female	Poor	Non-poor	Poor	Non-poor
0	19	4	75	25	33	67	2	5
1	42	9	75	25	57	43	7	8
2	35	7	72	28	48	52	7	6
3	33	7	60	40	48	52	8	10
4	45	10	66	34	45	55	97	9
5	80	17	55	45	49	51	16	16
6	208	45	68	32	52	48	50	47
Total	**461**	**100**	**66**	**34**	**50**	**50**	**100**	**100**

Note: Weighted figures

confirm some of the rural economy-wide impacts of the subsidy programme. It is not possible to quantify direct causal effects of the subsidy, but it is possible to evaluate the strength and patterns of association between subsidy implementation, its direct effects, and wider changes.

2.2.2 Input market impacts

This analysis is based on information from the household survey and the qualitative data and focuses on trends in purchases of commercial fertilisers and the impact of the subsidy programme. We use a regression based approach to estimate the demand in commercial fertilisers using panel households and we use qualitative interview data to triangulate the econometric and descriptive results. There may be selection bias in the household decision to participate in the commercial fertiliser market. We therefore use a two-step estimation procedure. In the first stage, we estimate the probit model of participation in the commercial fertiliser market using distance to the main road (as the identification variable) and household characteristics and quantity of subsidised fertilisers received by the household. In the second step, we estimate the demand for commercial fertilisers controlling for the selection bias using the Inverse Mills ratio obtained from the first stage. Two sub-samples are used to estimate the second stage equation: panel households that initially bought commercial fertilisers in IHS2 and panel households that bought commercial fertilisers in either IHS2 or FISS3. The null hypothesis is that subsidised fertilisers do not reduce the demand for commercial fertilisers at household level.

2.2.3 Direct beneficiary impacts

We use the panel regression method which exploits the matched panel data for rounds of data collection: IHS2) covering the 2002/3 and 2003/4 agricultural seasons, AISS1 for the 2006/7 season, AISS2 for the 2008/9 season, and FISS3 for 2010/11 agricultural season. For the panel data analysis, we use the fixed effects panel data strategy with the following specification:

$$Y_{it} = \alpha_i + \delta_t + \sum_{k=2}^{k=5} \beta_k(\delta_t * FISP_{ik}) + X_i + \varepsilon_{it} \qquad (1)$$

where i is the individual household, t is the wave of the survey (2004/05, 2006/7, 2008/9 and 2010/11), k indexes the household categorization of access to subsidies over the past 6 years, α_i are individual fixed effects, δ_t is a dummy variable equal to 1 for the each round of the survey (with 2004/5 as the base category), otherwise equal to zero, and ($\delta_t * FISP_k$) is the interaction dummy that is equal to 1 only for households that received fertiliser subsidy in access category k, Y is the impact indicator, X is a vector of household characteristics. The coefficient β gives the impact of the subsidy programme. The FISS in 2010/11 tracked access to fertiliser subsidy since the programme started, and this has enabled us to account for the number of times the household had access to fertiliser subsidies between the 2005/06 and 2010/11 seasons. Households are categorized into five groups represented by dummy variables: never had access (base category), accessed 1 – 2 times, accessed 3 – 4 times, accessed 5 times and accessed 6 times (continuously). The impact indicators used in the regression model include food security, education and heath, assets and welfare and shocks[2]. Alternatively, we measure access to the subsidy programme by the quantity of subsidised fertilisers in place of dummy variables. The panel analysis is based on the full panel sample (461 households) and a sub-sample of panel households that were identified as poor based on per capita expenditure in the IHS2 (227 households). The latter allows us to investigate the impact of the subsidy programme on households that had the same initial condition prior to the subsidy programme.

Table 2 presents the various indicators that have been selected to test various hypotheses on the direct beneficiary impacts of the subsidy programme. In addition to the broad hypothesized relationships in table 2, we also expect the subsidy to have larger impacts on households that have had access to subsidised fertilisers in all of the past 6 seasons compared to those that have had less access. This implies that there should be a positive trend in the value of the coefficients of times of receipt of subsidy, as the frequency of receipt increases from 1 to 6 times.

There are, however, two main caveats to the household-level analysis of direct beneficiary impacts. First, most of the indicators are subjective assessments by households; hence with the difficulties of calibration and differences in the timing of interviews, caution must be exercised in interpreting the panel level results. Second, if economy-wide effects are much stronger, such that the subsidy

Table 2 Beneficiary household level impact indicators and hypotheses

Outcome variables	Impact Indicators	Impact: Alternative Hypothesis
Food Security	1) Adequacy in food consumption in past month	Positive
Schooling and Health	1) Primary school enrolment at household level 2) Incidence of under-5 illness	Positive Negative
Subjective Poverty	1) Subjective assessment of poverty status	Positive
Shocks and Stresses	1) Number of shocks experiences by household 2) Incidence of severe agricultural-related shocks	Negative Negative

Note: Weighted figures

benefits all households, the impacts at household level may be weak regardless of direct benefits or number of times of access to subsidised fertilisers in the past 6 agricultural seasons. In this case the econometric results may not be able to pick these small changes.

3.0 Impacts of the Farm Input Subsidies

3.1 Economy-wide effects

The macroeconomic environment since the introduction of the farm input subsidy programme has remained relatively stable. Table 3 shows trends in some of the macroeconomic indicators between 2005 and 2010. From 2005 up to 2008 the economy witnessed increases in the both agricultural and gross domestic product. Since 2009, the economy has witnessed a decline in the growth rate but it has still been growing at above 6 percent. Agricultural output grew by 6.6 percent in 2010 compared to 10.4 percent in 2009. The reduction in agricultural growth rates have been attributed to the dry spell that hit some parts of the country. The overall growth rate in gross domestic product in 2010 was largely helped by the 53 percent growth rate in the mining sector, implying that growth could have been much lower without the emerging mining sector. Nonetheless, both the growth rates in gross domestic product and agricultural output have been partly attributed to the subsidy programme and the good rains that the country has witnessed over the past 6 agricultural season.

There has also been price stability over the period of implementation of the farm input subsidy, with inflation on a declining trend from 15.4 percent in 2005 to a single digit level of 7.4 percent in 2010, although maize prices rose dramatically from early 2008 to early 2009, before falling back in mid 2009 to 2010. Figure 2, right panel, shows that inflation continued to fall owing to the low prices of maize that have been experienced in 2009. Maize prices account for a significant proportion of the food component of the consumer price index, and reduction in maize prices have exerted downward pressure on the general price level and food inflation. Reductions in the price of maize in 2006/7 and 2009/10 are attributed to the economy-wide effect of the subsidy programme that improved availability of maize in the economy[3]. These positive macroeconomic developments have also been accompanied by reduction in the projected incidence of poverty as shown in figure 2, left panel. Since 2006, the poverty rate based on the model-based prediction fell from 52 percent to 39 percent in 2009.

Some of these national level developments were confirmed from the household survey and qualitative interviews data. Figure 3 shows the levels of maize and tobacco prices and *ganyu* (casual labour) wage rates between 2009 and 2011. With respect to maize prices, overall the prices at which households bought maize was below Malawi Kwacha (MKW)30 per kilogram[4], except for January 2010 (figure 3a). Generally, Blantyre and Thyolo experienced higher maize prices while Lilongwe and Kasungu experienced lower maize prices. Tobacco prices generally fell between 2009 and 2010 (figure 3b), although in Blantyre and Zomba households reported

Table 3 Macroeconomic performance indicators, 2005 – 2010 (%)

Indicator	2005	2006	2007	2008	2009	2010
Real Agricultural Growth	-7.8	12.3	12.3	11.8	10.4	6.6
Real GDP Growth	3.3	6.7	8.6	9.7	7.7	6.7
Inflation	15.4	13.9	8.0	8.7	8.4	7.4
Deficit/GDP Ratio (actual)	-0.4	-1.4	-4.0	-6.3	-5.5	1.6
Deficit/GDP Ratio (budget)	-2.6	-1.5	-1.8	-7.8	-8.2	4.0
Debt/GDP ratio	-	8.2	8.2	17.4	15.1	15.7

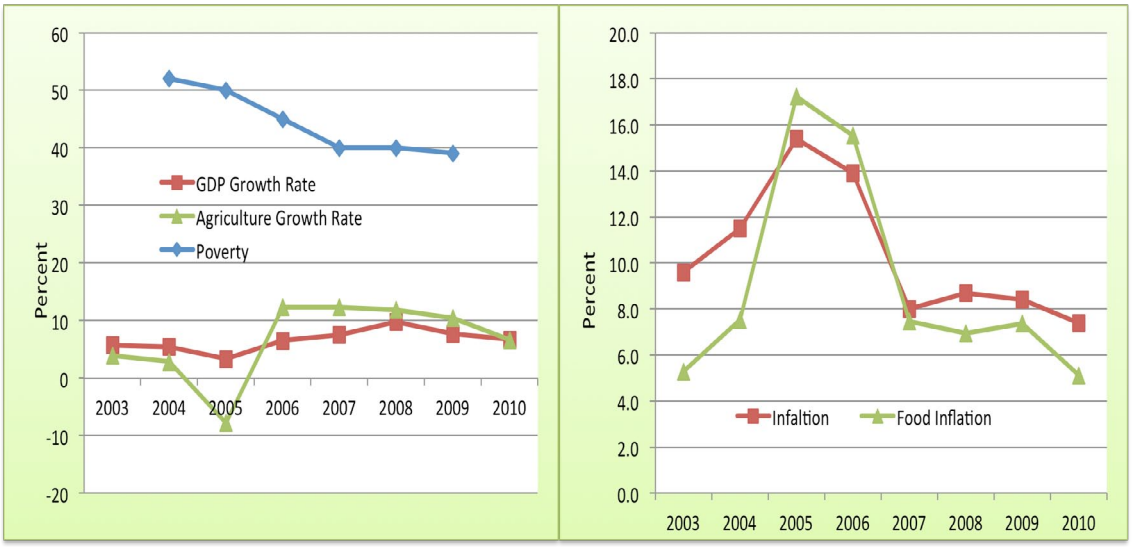
Source: Reserve Bank of Malawi, Financial and Economic Review, 22 (4), 2010

The deficit/GDP ratio in the fiscal budget has been worsening, particularly up to 2009 from -1.5 percent in 2006 to -8.2 percent in 2009. However, based on projected actual figures, there was expectation of a surplus of 1.6 percent of gross domestic product in 2010. More worrying is the increase in the indebtedness of the country from 8.2 percent of gross domestic product in 2006 to 15.7 percent of gross domestic product in 2010. The peak in domestic debt appears in 2008/2009, which also witnessed high fiscal deficit/GDP ratio and this was also the year the subsidy cost was 6.6 percent of gross domestic product and the subsidy budget was over-spent by about 87 percent, partly due to higher fertiliser prices and partly due to expansion of the programme (Dorward et al, 2010).

improved tobacco prices compared to the previous season. With respect to wages (figure 3c), there is an increase in wages over time as reported by households, and these increases occurred in all the districts surveyed. In terms of levels, in Mzimba and Kasungu households reported the highest wage rates while Thyolo and Phalombe households reported the lowest wage rates.

These wage rates and maize price developments were also widely reported in focus group discussions and life histories of some of the beneficiaries. In most beneficiary life histories, among poor households, engaging in *ganyu* to earn income to purchase food is a common strategy and such improvements in wages and reduction in maize prices made maize more affordable even for poor households. This is confirmed in figure 3d which shows

Figure 2 GDP growth, agricultural growth, poverty and inflation, 2003 – 2010



Source: Computed by authors based on FISS3 survey data

real increases in *ganyu* wages in terms of its maize grain purchasing power. Overall, the maize purchasing power of daily *ganyu* wages increased by 47 percent between January 2009 and January 2010, with the highest increase of 80 percent in Ntcheu and lowest increase of 34 percent in Phalombe. Since these increases in real *ganyu* rates benefit both recipient and non-recipient households, the results suggest that the rural economy-wide benefits of the subsidy programme are very strong. These high wages also enabled poor households to spend less time on *ganyu* in order to earn income adequate to purchase food whenever their own stock runs out. This reduction in time spent on *ganyu* was universally reported in focus group discussions and life histories of beneficiary households. For earlier years of the FISP, survey and FGD work in 2006/07 demonstrated similar processes of falling maize prices, rising wage rates, and falling time spent on *ganyu* from 2005 to 2007. Surveys and FGDs in 2009 suggested that from 2007 to 2009, rising maize prices and constant nominal *ganyu* rates led to some fall back in real *ganyu* rates. This has then been strongly reversed from 2009 onwards, as discussed above.

3.2 Impacts on farm input markets

The farm input subsidy programme can have several impacts on the input market system depending on the scale, targeting and other implementation modalities. On one hand, a poorly targeted large scale programme results in displacement of commercial sales and introduces disincentives for private investments in input markets. On the other hand, a well targeted programme can stimulate additional demand for commercial fertilisers among subsidised households by improving the productivity

Figure 3 Average maize prices, tobacco prices and ganyu wages 2009 – 2011

Source: Computed by authors based on FISS3 survey data

and profitability of their farming activities and their ability to finance fertiliser purchases. Table 4 shows the quantity of subsidised and commercial fertilisers acquired by households in 2009/10 and 2010/11 seasons by IHS2 poverty status compared with commercial fertilisers in the IHS2. Among poor households the average quantity of subsidised fertilisers declined from 54 kilograms in 2009/10 to 47 kilograms in 2010/11 while commercial fertilisers increased from 48 kilograms to 61 kilograms. A similar trend is observed among non-poor households, and may be related to economy-wide impacts of the programme. The data also show that both poor and non-poor households supplement subsidised fertilisers with commercial fertilisers, but among the poor the higher the number of seasons a household benefits from the subsidy the lower the supplementation with commercial fertilisers. No consistent pattern emerges with respect to non-poor households that are subsidised.

A comparison of the 2009 and 2010 commercial purchases with 2004/05 purchases shows a mixed picture among different households. On one hand, among the category of poor households only those that have had access to the subsidy over 1 season and 3 seasons are on average purchasing more in 2010 than in 2004/05. On the other hand, among the non-poor households only for households that have had access to the subsidy in the past 2 and 4 seasons do we witness purchases above the 2004/05 levels. This suggests some crowding out of commercial fertiliser sales due to the subsidy programme, although the decline in commercial purchases also occurred among households that have never received subsidised fertilisers. However, it should also be noted that the average prices of commercial fertilisers have substantially increased from MK37 per kilogram in 2004/5 to MK97 per kilogram in 2010/11, an increase of 162 percent over the period; this might have dampened the demand for commercial fertilisers.

Table 5 presents regression results of the factors that affect participation in the commercial fertiliser market and the demand for commercial fertilisers. Model (1) shows that the probability of participation in the commercial fertiliser market in 2002/03, 2003/04 and 2010/11 is positively influenced by male headship of household, number of adult equivalent members, years of education of household head, fertiliser prices, initial access to credit and value of assets. The probability of participation falls significantly with quantity of subsidised fertilisers and poverty. In addition, participation is higher in the central region than in the southern region and higher in 2002/03 and 2003/04 seasons than in 2010/11 season. However, we find a positive relationship between the price of fertilisers and participation in commercial fertiliser market as was the case in Ricker-Gilbert et al (2010). The marginal effect is just 1.7 percent, implying that households that decide to participate in the commercial market do so regardless of small increases in prices. The other unexpected result is the distance to the main road where the coefficient is positive. Nonetheless, given the presence of fertiliser markets in remote areas, distance to the main road maybe a poor proxy for the transaction costs to input markets and its marginal contribution to the probability of participation is less than 1 percent.

Model (2) estimates the demand for commercial fertilisers for households that bought commercial fertilisers in the IHS2 only. This informs us about the buying behaviour of these households as a result of the FISP. The results show that demand for commercial fertilisers is positively associated with number of adult equivalents, years of education of household head, maize prices, initial access to credit and value of assets; and it is negatively associated with quantity of subsidised fertilisers and poverty. With respect to the coefficient of quantity of subsidised fertilisers, the elasticity shows that a 1 percent increase in subsidised fertilisers reduces demand for commercial fertilisers by 0.39 percent. This suggests that subsidised fertilisers displace commercial fertiliser purchases among those who purchased fertilisers in 2002 – 2004 seasons. These households accounted for 54.1 percent of the total subsidised fertilisers in the sample, and using the relative shares of subsidised fertilisers we obtain weighted elasticity of -0.21, as the overall effect of subsidised fertilisers on commercial demand. However, we find a positive

Table 4 Quantity of subsidised and commercial fertilisers by IHS poverty status (kg)

Times of subsidy access	Poor households in IHS2						Non-poor households in IHS2					
		Subsidy		Commercial				Subsidy		Commercial		
	N	2009	2010	2004/5	2009	2010	N	2009	2010	2004/5	2009	2010
0	4	0	0	82	58	55	11	0	0	691	132	128
1	17	3	12	37	61	79	18	10	17	123	246	250
2	15	44	20	176	126	92	13	32	17	221	157	181
3	18	52	36	68	29	80	23	35	44	174	98	99
4	22	59	50	130	54	70	22	49	39	79	141	151
5	37	51	38	52	31	51	37	54	40	162	72	102
6	114	70	66	72	40	51	112	75	74	116	61	63
All	227	54	47	78	48	61	236	53	49	165	100	109

Source: computed by authors based on IHS2 and FISS3 data

Table 5 Factors influencing participation and demand for commercial fertiliser

Independent variables	(1) Participation in commercial fertiliser market *(Probit)*		(2) Demand for commercial fertilisers if bought in IHS2 *(Tobit)*		(3) Demand for commercial fertilisers if bought in IHS2/ FISS3 *(Tobit)*	
	dF/dx	z	elasticity	z	elasticity	z
Inverse Mills ratio	-	-	0.4310	0.57	0.5489	1.60
Age of HH head (years)	-0.0032	-0.95	0.4340	0.72	-0.1807	-0.65
Male HH head *	0.2565	2.03[b]	0.0243	0.06	-0.0117	-0.06
Number adult equivalents	0.0697	2.46[b]	2.4883	3.66[a]	1.2548	4.89[a]
Years of education HH head	0.0576	3.46[a]	0.9013	2.19[b]	0.4195	2.32[b]
Extension advice on fertilisers	-0.1432	-0.90	0.0118	0.16	0.0045	0.13
Land in hectares	-0.0037	-0.72	-0.0202	-0.61	0.2739	3.84[a]
Quantity of subsidised fertilisers in kg	-0.0092	-5.28[a]	-0.3904	-1.91[c]	-0.2912	-2.92[a]
Poor household self-assessment *	-0.4415	-1.75[c]	-1.3844	-2.07[b]	-0.9027	-3.02[a]
Average district maize prices – May-Oct	0.0177	0.98	4.3367	2.58[a]	1.2089	1.52
Fertiliser prices at EA level	0.0168	4.00[a]	0.6593	0.54	0.1065	0.17
Initial Access to credit in 2004/05	0.7121	3.64[a]	0.2965	2.52[a]	0.1316	2.52[a]
Business enterprise (0/1)	0.0248	0.22	-0.2892	-1.13	-0.0930	-0.75
Distance to main road in km	0.0007	0.21	-	-	-	-
Value of assets in MK	0.0000	3.51[a]	0.0618	3.20[a]	0.0360	4.25[a]
Participation in labour market (0/1)	-0.0161	-0.15	-0.1651	-1.23	-0.1153	-1.71[c]
Received remittances *	-0.0394	-0.36	-0.2504	-1.01	-0.1113	-0.95
North *	0.0404	0.20	0.3193	2.67[a]	0.2008	4.31[a]
Centre *	0.3286	2.02[b]	0.8551	2.98[a]	0.3700	3.27[a]
2002/03 season *	0.7935	2.27[b]	0.7005	1.81[c]	0.3001	1.51
2003/04 season *	0.7665	2.14[b]	0.5197	1.47	0.1258	0.69
Wald chi2(20)		108.58		148.22		179.81
Prob > chi2		0.000		0.000		0.000
Number of observations		926		564		533
Number of households		463		282		353

Notes: These are random effects models. (*) dF/dx and elasticities are for discrete change of dummy variable from 0 to 1. Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively.

coefficient of average district fertiliser prices, which is unexpected, but it is statistically insignificant. This maybe partly due to the high level of aggregation of fertiliser prices from survey data that might have dampened the changes in fertiliser prices and as observed earlier that small changes in prices do not hamper participation in the fertiliser market for households that decide to participate due to the perceived benefits of applying fertilisers.

Model (3) uses a sub-sample of households that purchased commercial fertilisers either in IHS2 or/and FISS3, and captures those households that might have entered the commercial market during the subsidy period – hence those that did not buy in IHS2 but bought commercial fertilisers in FISS3. If the subsidy encourages purchase of commercial fertilisers among some households, for example those that see the benefits of applying subsidised fertilisers, then we expect the elasticity with respect to subsidised fertilisers to fall in model (3) compared to model (2). The coefficient of subsidised fertilisers shows an elasticity of -0.29, implying that a 1 percent increase in subsidised fertilisers leads to a 0.29 percent reduction in the demand for commercial fertilisers among those that purchased commercial fertilisers in either IHS2 or/and AISPS. The weighted elasticity using relative shares of subsidised fertilisers is -0.15 for the whole sample of panel households. This elasticity is lower than the -0.39 observed for panel households that initially bought commercial fertilisers in IHS2. The demand for commercial fertilisers also falls for poor households and households that participate in labour markets but increases with number of adult equivalents, education, land holding size, average maize prices and value of assets. The demand is also much higher in the central region and northern region compared with the southern region, possibly due to the cultivation of tobacco in the central and northern region.

3.3 Direct beneficiary household impacts

3.3.1 Household food security

Improvements in maize production should lead to improved food availability and food security for beneficiary households. In all the panel surveys, households were asked whether they considered their

food consumption in the month before the survey to be inadequate or adequate. In order to assess the impact on food security, we created a dummy variable representing adequacy in food consumption equal to one if the household revealed that food consumption was adequate or more than adequate, and to zero if it was inadequate.

Table 6 presents the fixed effects (within) estimates of the impact of the subsidy programme on food security. Model (1) results show that among households that received subsidised fertilisers continuously (6 times) about 22% more than non-recipients reported adequate food production, with the coefficient being statistically significant at the 5% level. Increasing frequency of fertiliser use also led to increasing frequency of reported adequate food production. Similarly with Model (2), using the quantity of fertilisers received, there is evidence of a positive and significant relationship between food consumption adequacy and quantity of subsidised fertilisers. These results are consistent with the qualitative evidence of increased maize production reported in focus group discussions, which might have improved food consumption. Holden and Lunduka (2010a) also find that receipt of subsidised inputs increases the probability of households being net sellers rather than net buyers of maize, and that 66% and 69% of surveyed households reported improvements in household and community food security as a result of the subsidy programme (although 60% of the households in their sample were still net buyers of maize despite the subsidy programme).

3.3.2 *Impact on education: Primary school enrolment*

We investigate the impact of beneficiaries' access to subsidised inputs on schooling based on enrolment of the primary school age group (5 - 13 year olds) while controlling for household characteristics. This analysis uses a two-period panel, IHS2 and FISS, in which members of households older than 5 years were asked whether they were in school. This enabled us to generate an indicator of school enrolment at household level. Primary enrolment at household level is computed as the number of primary school age children in school divided by the total number of primary school going age children in the household. Table 7 shows results for the impact of subsidy access on primary school enrolment and the panel results indicate that the subsidy has a positive impact on schooling. Examining all households, there has been a general increase in school enrolment between the two periods, a change that was universally confirmed in focus group discussions and key informant interviews. The coefficients of 1-2 times, 5 times and 6 times access dummies to the subsidy programme are statistically significant at the 5%, 1% and 10% level, respectively. However, there is no clear trend in the value of the coefficients of the number of times of receipt and primary school enrolment. Similar but weaker relationships are observed for the model sample estimated only for households categorised as poor in the IHS2.

Table 6 Fixed-effects regression estimates of impacts on food consumption

Dependent variable = 1 if household had adequate or more food in the past month of the survey	(1) All Households		(2) All Households	
	β	Z	β	Z
Dummy for 2006/7 survey	0.1001	1.6	0.1132	4.19[a]
Dummy for 2008/9survey	0.3354	4.14[a]	0.3857	13.48[a]
Dummy for 2010/11survey	-0.0934	-1.09	0.0331	1.04
Quantity of subsidised fertiliser (kg)	-	-	0.0007	2.27[b]
Dummy received subsidy 1 – 2 times*	0.0386	0.61	-	-
Dummy received subsidy 3 – 4 times*	0.1173	1.34	-	-
Dummy received subsidy 5 times*	0.1758	1.45	-	-
Dummy received subsidy 6 times*	0.2163	2.23b	-	-
Durable assets (000 MK)	0.0001	0.29	0	0.14
Logarithm of land (hectares)	-0.0033	-0.33	-0.0047	-0.42
Dummy male-headed household	0.046	0.82	0.0428	0.94
Age of household head (years)	0.0001	0.08	0.0002	0.14
Years of education HH head (years)	0.0084	1.32	0.0067	0.95
Constant	0.3953	4.73a	0.3963	3.83[a]
R-squared		0.1656		0.1635
Wald chi-squared		729.15		675.5
Prob> chi-squared		0.000		0.000
N		1844		1844
Number of Households		461		461

Notes: * The dummies represent cumulative receipt at each survey round from 2005/06. Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

Table 7 Fixed-effects regression estimates of impact on household school enrolment

Dependent variable = primary school enrolment at household level	Panel Households *Fixed Effects*		Panel Households *Fixed Effects (Poor in IHS2)*	
	β	Z	β	Z
Dummy 2011 for survey	-0.1279	-1.06	-0.3782	-1.21
Dummy received subsidy 1 – 2 times	0.3135	2.26[b]	0.5364	1.74[c]
Dummy received subsidy 3 – 4 times	0.1881	1.55	0.3776	1.16
Dummy received subsidy 5 times	0.3374	2.70[a]	0.5828	1.87[c]
Dummy received subsidy 6 times	0.1977	1.67[c]	0.3795	1.20
Durable assets (000 MK)	0.0000	-0.10	0.0031	0.99
Logarithm of land (ha)	0.0523	2.00[b]	0.0780	2.76[a]
Dummy male-headed household	0.1655	2.24[b]	0.0812	0.91
Age of household head (years)	-0.0014	-0.65	-0.0004	-0.13
Years of education HH head (years)	-0.0153	-1.40	-0.0063	-0.42
Constant	0.8174	6.66[a]	0.7802	4.35[a]
R-squared		0.1158		0.1191
Wald chi-squared		31.15		19.49
Prob > chi-squared		0.001		0.035
N		653		371
Mean of dependent variable: 2004/05	*0.8148*		*0.8903*	
Mean of dependent variable: 2010/11	*0.8956*		*0.8100*	

Notes: Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

The estimated positive impact of subsidy receipt on educational enrolment is consistent with anecdotal reports on programme impacts, with focus group discussion reports (School of Oriental and African Studies et al., 2008; Dorward and Chirwa, 2010a), and with Holden and Lunduka (2010) who report that 65% of respondent households perceived that there was a positive impact of subsidy receipt on school attendance.

3.3.3 Impact on health: Incidence of under-5 illness

Improvements in food availability at household level due to access to subsidised fertilisers may improve beneficiaries' health in a number of ways – through improved food security and nutrition from increased own production and income, and from increased ability to finance health care. This can be investigated in a number of ways. We examine the impact of subsidy receipt on incidence of illness using data for households that had under-5 members in 2004/5 and 2010/11. On average, about 59% of households had ill under-5 members in 2004/5, but this fell to 49% in 2010/11. This impact was not commonly articulated in focus group discussions and key informant interviews. The econometric evidence of the impact of the subsidy programme on the health of children in beneficiary households shows that households that had access to subsidy at least 5 times were more likely to have under-5 children that had not fallen ill in the past two weeks of the survey (table 8). Overall, there is a negative relationship between access to subsidy and incidence of under-5 illness. In the panel regression analysis, the coefficients of dummies for households that have had access to subsidised fertilisers for 5 times and 6 times are statistically significant at the 5% level. Holden and Lunduka (2010) also explored people's perceptions of subsidy receipt on health, and report that 40% of respondents perceived that subsidy receipt improved health. Further evidence on the impacts of subsidy access on health, but not of access to FISP itself, is provided by Ward and Santos (2010), who examined the impact on stunting from access to Targeted Input Programme inputs. They found a significant reduction in stunting for each year of receipt of TIP inputs, and based on strong international evidence on the relationship between adult height and wages; discuss possible long term beneficial effects of increased adult height on earnings.

3.3.4 Subjective poverty or well-being, real income and assets

The panel surveys consistently collected information on self-assessment of well-being and we use the subjective measures as outcome indicators of participation in the farm input subsidy programme. Well-being is assessed using households' subjective assessment of their poverty status based on a ladder ranging from 1 representing the poorest to 6 representing the richest. Table 9 presents results of the subjective assessment of poverty for panel analysis. The mean self-assessment of well-being for panel households increased from 1.66 in 2004/05 to 2.34 in 2010/11, representing a 41% increase. After controlling for household and year effects in model (1), the results show that households' self assessments were higher by 54%, 69% and 68% in the 2006/7, 2008/9 and 2010/11 surveys respectively as compared with the pre-subsidy survey, with positive coefficients of the year dummies

Table 8 Fixed-effects regression estimates of impact on incidence of under-5 Illness

Dependent variable = 1 if household had an ill under-5 member	Panel households *Fixed effects*	
	β	t
Dummy for 2011 survey	0.0165	0.16
Dummy received subsidy 1 – 2 times	-0.0913	-0.56
Dummy received subsidy 3 – 4 times	0.1618	1.33
Dummy received subsidy 5 times	-0.3634	-2.05[b]
Dummy received subsidy 6 times	-0.2398	-2.11[b]
Durable assets (000 MK)	-0.0002	-0.53
Logarithm of land (ha)	0.0498	0.81
Dummy male-headed household	-0.1766	-1.25
Age of household head (years)	-0.0016	-0.28
Years of education HH head (years)	0.0062	0.25
Constant	0.7752	3.30[a]
R-squared		0.1223
F		35.24
Prob >F		0.000
N		446
Mean of dependent variable: 2004/05	*0.5928*	
Mean of dependent variable: 2010/11	*0.4895*	

Notes: Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

statistically significant at the 1% level. However, the estimated impacts of subsidy receipt by beneficiaries households are (except for access in 5 seasons) negative, but small and not statistically significant. The results in model (3) where we use the quantity of subsidised fertilisers are similar to model (1). In model (2) we use a sub-sample of panel households that were identified as poor in IHS2 and find similar results of no statistically significant relationship between self-assessed poverty and the receipt of subsidised fertiliser, but again the year dummies are positive and statistically significant at the 1% or 5% levels.

We cannot, therefore, reject the null hypothesis that receipt of the subsidy does not statistically affect changes in self-assessment of poverty among beneficiaries. This suggests that the subsidy programme may have only weak direct income effects on beneficiary households.

Table 9 Fixed-effects regression estimates of impact on subjective poverty assessment

Dependent variable = subjective assessment of poverty status (1=poorest – 6 =richest)	(1)		(2)		(3)	
	All Households		Poor in IHS2		All Households	
	β	z	β	z	β	z
Dummy for 2006/7 survey	0.5362	5.94[a]	0.4931	4.77[a]	0.3812	7.01[a]
Dummy for 2008/9 survey	0.6898	5.82[a]	0.5775	3.40[a]	0.5339	7.28[a]
Dummy for 2010/11 survey	0.6825	5.61[a]	0.5187	2.31[b]	0.5097	4.59[a]
Quantity of subsidised fertiliser (kg)	-	-	-	-	0.0226	1.00
Dummy received subsidy 1 – 2 times*	-0.1513	-1.6	-0.1063	-0.86	-	-
Dummy received subsidy 3 – 4 times*	-0.0771	-0.61	0.0437	0.23	-	-
Dummy received subsidy 5 times*	0.0036	0.02	0.2582	0.97	-	-
Dummy received subsidy 6 times*	-0.0734	-0.56	0.0368	0.14	-	-
Durable assets (000 MK)	0.0002	0.16	0.0073	1.14	0.0002	0.18
Logarithm of land (hectares)	0.0173	1.28	0.0199	0.92	0.017	1.04
Dummy male-headed household	0.1301	1.77[b]	0.2542	2.65[a]	0.129	2.05[b]
Age of household head (years)	-0.001	-0.41	0.0041	1.01	-0.001	-0.34
Years of education HH head (years)	0.0215	1.83[b]	0.0478	2.16[b]	0.0209	1.80[b]
Constant	1.5406	12.1[a]	0.9631	4.54[a]	1.5419	10.9[a]
R-squared		0.1523		0.1945		0.1498
Wald Chi-squared		507.1		322.31		371.13
Prob>Chi-squared		0		0		0
N		1844		908		1844
Number of Households		461		227		461

Notes: * The dummies represent cumulative receipt at each survey round from 2005/06. Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

The results are consistent with sentiments expressed in qualitative interviews in which most households report that they are not able to produce surplus maize which could be sold to earn extra cash income. Some life histories with selected households revealed that although some have had access to subsidised fertilisers continuously they may still struggle to produce maize that takes them to the next harvest and have to rely on *ganyu* to earn income to purchase food. Small but insignificant positive effects are consistent with small direct improvements from subsidy receipt which may be overshadowed by wider positive changes affecting all households through indirect market effects of the subsidy and other positive changes from 2002/3 and 2003/4 to 2006/7 and subsequent years. However, the difference between the dummy variables for 2008/9 and 201/11 is very small, suggesting that after a substantial improvement in perceived wellbeing from the pre-subsidy to 2006/7 surveys and a smaller improvement from 2006/7 to 2008/9 - there may have been little or no further improvement in perceived wellbeing from 2008/9 to 2010/11. In contrast with these results, however, Ricker-Gilbert and Jayne (2010) do find a significant increase in satisfaction with life with increased receipt of subsidised fertiliser between the pre-subsidy and 2008/9 surveys.

The weak results on poverty impacts are consistent with the weak relationship between access to subsidy and, real incomes and asset accumulation. With respect to real incomes, Ricker-Gilbert (2011) finds no significant impacts of subsidy receipt on non-farm income or on total household income, although net value of rainy season crop production (a measure of farm income) is positively affected by subsidy receipt in the year of receipt (but not previous years), with each extra kg of fertiliser received increasing net crop income by MK174. Dorward and Chirwa (2012) in an informal rural economy modelling compare real income estimates for 'target households' (that is poor male- and female-headed types) with and without the subsidy (with an average receipt of 75kg and 2 kg of subsidised fertiliser and hybrid maize seed respectively per household) but with constant prices (that is without any wider market equilibrium effects). Gains averaging around 7% (just under MK1,000) across poorer beneficiary households are estimated in the Shire Highlands with lower gains (around 4%, just under MK450) in the Kasungu-Lilongwe Plains, where poverty is less severe and poor households are less capital constrained and have lower returns to capital. SOAS et al. (2008) also state that increases in beneficiary incomes were reported in a number of focus group discussions in 2007.

With respect to asset accumulation, Holden and Lunduka (2010) in examining the impacts of subsidies on the value of assets and on livestock ownership measured in tropical livestock units find a general build-up in the real value of assets from 2006 to 2009, but no evidence of direct impacts of subsidy receipt on asset accumulation. Hence, there is no evidence of a general increase in livestock endowments, nor of direct subsidy impacts on asset accumulation. Similarly, Ricker-Gilbert (2011) report no significant impact of subsidy receipt on household livestock and durable assets for subsidy received in the survey year or in each of the previous three years.

3.3.5 Shocks and stresses

Changes in vulnerability of households to shocks and stresses are another possible impact of subsidy receipt on household welfare. Households experience a number of shocks and stresses and most of these shocks are agricultural related. Using the panel surveys we investigate whether there is a relationship between the extent of subsidization and shocks experienced by

Table 10 Fixed-effects regression estimates of subsidy impact on shocks and stresses

Dependent variable = number of shocks experienced by household	IHS2 and FISS		IHS2 and FISS	
	All households		Poor in IHS2	
	β	z	β	z
Dummy for 2011 survey	-2.1969	-2.88[a]	-3.1106	-6.28[a]
Dummy received subsidy 1 – 2 times	1.7775	1.98[c]	1.9909	1.92[c]
Dummy received subsidy 3 – 4 times	2.1529	3.06[a]	3.3164	4.46[a]
Dummy received subsidy 5 times	1.2333	1.44	2.3676	3.62[a]
Dummy received subsidy 6 times	1.432	1.97[c]	2.2015	3.49[a]
Durable assets (000 MK)	0.0017	0.62	0.0026	0.07
Logarithm of land (ha)	0.086	1.19	0.0818	0.57
Dummy male-headed household	0.2269	0.61	0.1663	0.32
Age of household head (years)	-0.0504	-3.91[a]	-0.0607	-3.78[a]
Years of education HH head (years)	-0.0137	-0.22	-0.176	-1.82[c]
Constant	6.6486	9.91[a]	8.0741	8.03[a]
R-squared		0.0996		0.1441
Wald Chi-squared		53.35		156.92
Prob>Chi-squared		0.000		0.000
N		922		454
Number of Households		461		227

Notes: Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

households. Table 10 shows the fixed-effects regression model estimates using IHS2 and FISS survey data. With respect to the relationships between shocks and the frequency of subsidization, the estimated coefficients for dummy variables show that although the number of shocks declined between 2004/05 and 2010/11, recipients of fertiliser subsidies tend to experience more shocks than non-recipients. We find a statistically significant relationship between experience of shocks and those households that have had access to the subsidy, and the magnitudes are higher for recipients that have had access less than 5 times. Similar results are obtained in model (2) which only focuses on households that were classified as poor in IHS2. We find all the coefficients of dummies representing the frequency of receipts of subsidised fertilisers to be statistically significant at the 10% or 1% levels. A possible explanation is that there is some targeting of the subsidy to households who have experienced shocks. This would be consistent with higher and more significant coefficients for households who have accessed subsidies less than five times.

We explore these issues further in Table 11, which reports results of the relationships between frequency of access to subsidised fertilisers and the incidence of agriculture-related shocks where these were reported as the most severe shock. The analysis shows mixed results. The full panel results based on all panel households show that the subsidy is not significantly related with the incidence of agricultural shocks, although generally the incidence of severe agriculture-related shocks has declined over time. However, for the sub-sample of panel households identified as poor in IHS2, there is no evidence that severe agriculture-related shocks have declined. However, importantly, households with access to subsidised fertilisers are less likely to have agriculture-related shocks as their most severe shock, but there is no clear trend to suggest that the higher the number of times household access subsidies the lower the number of agriculture-related shocks that households experience. Again these results may reflect more on the likelihoods of subsidy receipt by poor households affected by severe agriculture-shocks than on the impacts of subsidy receipt on vulnerability to agriculture-shocks.

In summary, the evidence on changes in shocks and stresses is rather mixed. Overall, the number of shocks experienced by beneficiary households has fallen significantly over time, although those with access to subsidised fertilisers continue to experience shocks and stresses. However, among beneficiary households, agriculture-related shocks are less likely to be the most severe shocks; hence the subsidy appears to have helped poor households to be cushioned or resilient against agriculture-related shocks.

There is a decline from 24% to 13% in households that experienced lower crop yields due to weather or rainfall as most severe shocks between IHS2 and FISS3, respectively (Table 12). Other agriculture-related shocks whose incidence declined were large falls in sale price of crops and large rise in prices of food. The relative importance of chronic and acute illnesses appears to have risen as a result of the decline in importance of severe agricultural shocks.

4.0 Impacts from Life Stories of Beneficiary Households

The analysis of life stories from selected beneficiaries reveals a mix of the impact of the subsidy on their well-being. While there are positive stories about the increase in food production at household level among most households that receive subsidies, the life histories illustrate the challenges of the programme in delivering

Table 11 Fixed-effects regression estimates of impact on agricultural-related shocks and stresses

Dependent variable = 1 if most severe shock experienced was agricultural related	IHS2 and FISS		IHS2 and FISS	
	All households		Poor in IHS2	
	β	z	β	z
Dummy for 2011 survey	-0.3539	-2.52[b]	0.0103	0.24
Dummy received subsidy 1 – 2 times	0.1124	0.68	-0.2013	-1.83[c]
Dummy received subsidy 3 – 4 times	0.1085	0.69	-0.3726	-3.39[a]
Dummy received subsidy 5 times	0.1225	0.78	-0.4168	-3.47[a]
Dummy received subsidy 6 times	0.1694	1.09	-0.1666	-2.18[b]
Durable assets (000 MK)	-0.0001	-0.19	0.0032	0.41
Logarithm of land (ha)	0.0141	1.44	0.0154	0.7
Dummy male-headed household	0.2132	3.54[a]	0.1772	1.37
Age of household head (years)	0.0006	0.31	-0.0016	-0.57
Years of education HH head (years)	0.0072	0.82	-0.0115	-0.66
Constant	0.2952	3.02[a]	0.5658	3.39[a]
R-squared		0.1293		0.1634
Wald Chi-squared		81.15		58.13
Prob>Chi-squared		0		0
N		922		454
Number of Households		461		227

Notes: Superscript a, b and c denotes statistically significant at 1%, 5% and 10% level, respectively. Standard errors obtained through bootstrapping at 50 repetitions.

Table 12 Most severe shocks and stresses experienced by households (%)

Most severe shock experienced for panel households	IHS2	FISS3
	2004/5	2010/11
Lower crop yields due to weather/rainfall	24.45	13.34
Crop diseases or crop pests	0.78	1.35
Livestock died or were stolen	3.01	6.09
Household business failure non-agricultural	3.41	1.61
Loss of salaried employment or non-payment	1.85	0.74
End of regular assistance, aid or remit	1.01	0.7
Reduced ganyu opportunities/wage rates	5.60	1.05
Large fall in sale prices for crops	19.30	7.07
Large rise in price of food	9.05	3.33
Short acute illness/accident of HH member	1.15	17.84
Chronic illness, disability or ageing of HH member	2.45	8.84
Birth in the household	4.23	0.75
Death of HH member	14.54	10.48
Marriage/other social event	1.60	2.95
Increased expenditure demands	2.82	2.79
Break-up of the household	1.60	1.92

direct benefits to beneficiary households. In most life histories of beneficiaries, particularly among the most vulnerable groups (female-headed, elderly-headed and child-headed households), the stories were that the subsidy programme has enabled them to produce 'a bit more food' than when they had no access to the subsidy. Appendix Box 1 and 2 provide selected sentiments from some beneficiaries on the impact of the farm input subsidy programme since the 2005/06 season. The qualitative analysis points to the following issues:

- In most cases, households that report success with the subsidy programme are those that are well to do and were already purchasing commercial fertilisers before the subsidy programme. For instance, one beneficiary who has had access to the subsidy over 5 seasons was also buying coupons that enabled him to profit from tobacco cultivation, and claimed to have transformed his life from poor category to the well-to-do category.

- In households that reported receipt and use of 2 fertiliser coupons, such households are likely to talk positively about the extent to which the subsidy improved their food production for such years compared to households that received less than 2 bags of subsidised fertiliser.

- Sharing of coupons is widespread. Most households that have participated in the subsidy programme attributed the perceived failure of the programme to change their lives significantly to the inadequate amounts of fertilisers obtained under the programme. This is particularly the case for households that never used fertilisers prior to the subsidy programme. Many life stories described how the full package of the subsidy was beginning to change their lives, only to experience drifting back into poverty due to the dilution of the subsidy as a result of the redistribution that takes place at village level.

- There is also a tendency for beneficiaries to spread the subsidised inputs thinly over a larger parcel of land. Even among households that receive 2 bags of subsidised fertilisers, there were sentiments that the subsidised fertiliser was not adequate for the amount of land the household has for maize cultivation. This is exacerbated by the lack of technical advice on the appropriate use of fertilisers, with most households expressing lack of access to agricultural extension services.

- There is widespread recognition that the subsidy has helped beneficiary households to produce a 'bit more maize' and more importantly in reducing the purchase price of maize even the in lean months of January and February. Most of the beneficiaries interviewed, particularly those that are still not able to produce own maize to last them to the next season, consider a low purchase price of maize as one major benefit of the programme.

- Households that are not able to produce maize that lasts up to the next harvest tend to purchase from the market. Most poor households engage in ganyu to earn incomes to buy maize and most reported that ganyu wage rates have been increasing while maize

prices have been falling and maize is locally available. This has enabled the poor to afford purchase of maize based on ganyu incomes which have also improved over time. Due to higher wages, households reported that they have reduced the amount of time they spend on ganyu and there has also been an increase in opportunities to operate off-farm income generating activities.

- Poor and vulnerable households such as female- and/or elderly-headed households that received subsidised fertilisers rarely supplement these fertilisers with commercial purchases, leading to application of subsidised fertilisers on larger parcels of land. Generally, where subsidised fertilisers are supplemented by commercial fertilisers, such households were buying commercial fertilisers prior to the subsidy and/or they are better off households that are also receiving subsidies. The quantitative analysis also shows that the supplementary commercial fertilisers are much less for poor households than for non-poor households that had access to subsidised fertilisers.

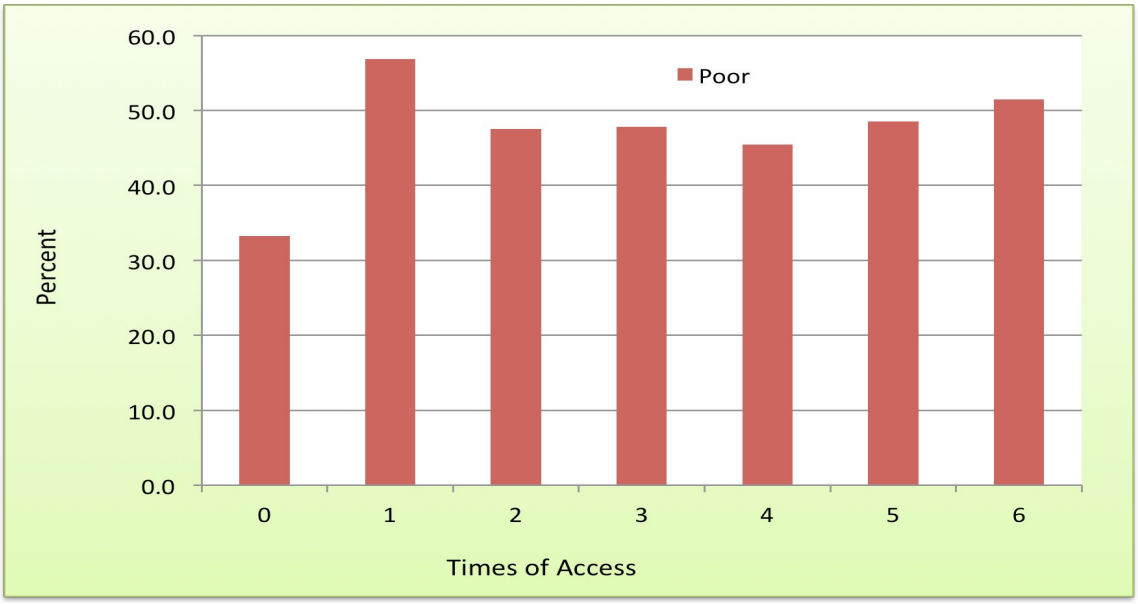
5.0 Prospects for Sustainable Graduation

The panel data analysis and the analysis of the case studies of beneficiaries also highlighted two challenges that have implications on direct beneficiary impacts and prospects of graduation from the subsidy programme: targeting and sharing of coupons at village level. These issued have been documented in Dorward and Chirwa (2011), but here we use panel data to illustrate the challenges of beneficiary targeting. Both targeting and size of the benefit package have implications on creating enabling environments for sustainable graduation from input subsidies. With respect to targeting, the targeting criteria in the FISP remain quite broad with the main criteria being 'resource poor households', and this has meant that a large proportion of households is eligible from the perspective of communities (SOAS et al, 2008). Although the FUM (2011) study suggests that all the households conformed to the criteria by the reason they gave for their being selected for the subsidy programme, a majority (60%) indicated that their being 'very poor' justified their receipt of coupons – but no information is provided on the status of households who did not receive the subsidy.

When we use the IHS2 poverty status of beneficiaries, as their initial condition, and data from IHS2 and FISS3 surveys, we find that the poor and non-poor are equally likely to receive subsidised farm inputs. The broadness of the targeting criteria therefore leads to high targeting errors. Figure 5 presents the proportion of the households that were identified as poor in the IHS2 based on per capita expenditure and their relative access to subsidised fertilisers in the past 6 agricultural seasons. The figure shows that only a third of those that had never received subsidised fertilisers were poor households in 2004/05. This would be broadly in line with the poor being more likely to receive subsidy coupons. However, among recipients of subsidised fertilisers, the highest proportion of the poor is in the category that only received the subsidy once in the past 6 seasons while for those that have continuously received fertiliser subsidy only about 51 percent were identified as poor in 2004/05. The panel data on who received subsidised fertilisers generally show that on average only half of the recipients were poor households on the basis of IHS2 poverty classification.

As observed above, non-poor households bought more commercial fertilisers on average than poor households although they received equal amount of subsidised fertilisers. This suggests that non-poor households could generally afford commercial fertilisers and receipt of coupons among them largely represented

Figure 4 Access to subsidised fertilisers by IHS2 poor households 2005 – 2010



targeting inclusion errors. This is also confirmed by the fact that there was no clear pattern in the perceptions of respondent households on which group was more likely than others to receive coupons, between better off farmers and poor and vulnerable households (Dorward and Chirwa, 2011).

With respect to redistribution of subsidy coupons within the villages, this practice has been widely reported by beneficiaries and from previous evaluations which indicate that a sizable proportion of households receive less than 2 coupons per household. Dorward and Chirwa (2011) find that 58 percent of households that received coupons in 2010/11 received less than 2 coupons; an increase from 49 percent in 2008/09 (Dorward et al, 2010). Table 13 shows the coupon allocation processes by the district, and it is evident that although the open system is widely used for allocation and distribution of coupons, redistribution is widespread within the village. On average, just under 80 percent of households indicated that open meetings were used in the allocation of coupons, with the highest proportion (97 percent) in Phalombe and the lowest (54 percent in Lilongwe). Similarly, use of open meetings in the distribution of coupons was also popular in the 2010/11 season, with 94 percent indicating the use of open forums. Lilongwe had the lowest proportion of 81 percent while Mzimba and Ntcheu had universal use of open forums in coupon distribution. The use of redistribution of coupons, which is unofficially organized by traditional leaders, is widespread. On average, just under 70 percent of respondents reported redistribution of coupons where sharing is organized in the 2010/11 season, compared to 43 percent in the 2008/09 season. Kasungu and Mzimba had a low incidence of redistribution, with only about a third of respondents reporting that such practices occurred in their village while for the rest of the districts redistribution was confirmed by more than two-thirds of respondents.

Widespread redistribution of fertiliser coupons was also confirmed from focus group discussions and life histories of beneficiaries. In focus group discussions, there was a mix of views on the extent of openness in the targeting processes, with politics playing a major role in some cases. Some groups also reported widespread sharing of coupons after the formal allocation process. Life histories of some beneficiaries also reported the problem that sharing of coupons diluted the direct benefit per household. The practice of redistribution of subsidised input undermines the direct impact of the programme on beneficiary households and is likely to reduce the effectiveness of the direct impacts of subsidy programme and undermines the potential for some households to graduate from the programme.

The issues of targeting and dilution of the benefits illustrate the challenges in improving the welfare of beneficiaries and the limits to sustainable graduation from the farm input subsidy programme. Although some households have accessed subsidised fertilisers for all the six agricultural seasons, the direct impacts on socio-economic outcome variables are mixed and weak, and there is no consistent evidence that households that have always received fertiliser subsidy perform significantly better than those that have received subsidies intermittently or have received none in the six agricultural seasons covered in the study.

6.0 Conclusions

The farm input subsidy programme which has been implemented in Malawi since the 2005/06 season has benefited households in different ways. The 2010/11 season marked its sixth year of implementation and some households have had continuous access while others have had intermittent access to subsidised fertilisers. This paper set out to evaluate the impact of the subsidy programme on the economy, input market systems and welfare of beneficiary households using the panel data estimation of difference-in-difference estimator.

Overall, although qualitatively communities point to the many benefits of the subsidy programme on food security, yields and other indicators of well-being, the econometric evidence that changes in welfare indicators are attributed to the direct effects of subsidy receipt is weak and mixed. These weak direct beneficiary impacts have also been found in earlier studies. For instance, Chirwa (2010) in an earlier impact evaluation also finds weak evidence of the direct impact of participation in

Table 13 Systems of fertiliser coupon allocation and distribution in 2010/11 season (%)

District	Open system of coupon allocation	Open system of coupon distribution	Redistribution of coupons within village
Mzimba	79.23	100.00	33.56
Kasungu	70.17	92.06	31.16
Lilongwe	53.65	80.96	67.20
Ntcheu	84.53	100.00	93.10
Zomba	92.67	99.44	87.80
Blantyre	88.23	99.09	76.58
Thyolo	92.30	98.85	94.97
Phalombe	97.22	96.17	96.33
Total	**78.66**	**94.05**	**69.29**

Source: Computed by authors based on FISS3 data

the subsidy programme on beneficiary households' food expenditure between 2004/05 and 2006/07. Similarly, Matita and Chirwa (2011), using panel data analysis, find mixed results on the direct impact of participation in the subsidy programme in improving agricultural growth of beneficiary households between the 2004/05 and 2008/09 seasons among households in different income quintiles. Other studies also find no significant relationship between receipt of fertiliser coupons and asset accumulation, and mixed evidence on impacts on real incomes. The direct beneficiary effects are somehow masked by the stronger economy-wide effects, in which the subsidy benefits both recipients and non-recipients thereby weakening differences between the two groups.

Nonetheless, households tend to benefit from the economy-wide impact of the subsidy programme through low maize prices and increased ganyu wage rates that have been experienced since the introduction of the subsidy programme. The subsidy programme seems to have stronger economy-wide effects than direct beneficiary household effects. Over the past 6 agricultural seasons of subsidy programme implementation, the prices of maize have fallen, contributing to macroeconomic stability through falling inflation from double digit to single digit figures. The decrease in the maize prices, together with reported increases in ganyu wage rates, has meant that the poor and non-poor can afford to purchase maize at reasonable prices. In fact, there has a been real increase in ganyu wage rates measured in terms of the amount of maize a daily wage could purchase between 2010 and 2011.

The impact analysis raises two challenges with implications for the direct beneficiary household impacts of the subsidy programme and their prospects for graduation. First, targeting of households remains problematic and a large proportion of non-poor households have access to subsidised farm inputs. This increases displacement of commercial sales and limit incremental production. However, the reduction in displacement in subsequent years suggests better prospects for input market development as one enabling condition for sustainable graduation. Secondly, the practice of redistribution of coupons at village level, which is largely driven by village-level politics, has led to dilution of the benefit package resulting in inefficient use of subsidised fertilisers among poor households that are not able to top up with commercial fertilisers, but cultivate larger parcels of land. This sharing of coupons tends to happen among poor households. These challenges of targeting, dilution of the benefit package and inefficiency in the application of inputs may also undermine prospects of graduation from the subsidy programme for most of the households.

Appendix Box 1 Selected positive life stories from the subsidy programme

"The programme has enabled me to apply fertiliser. At first I was doing business but I was not able to buy fertiliser and could end up buying maize every year. Nowadays subsidised inputs are cheap and I am able to buy fertiliser after doing ganyu or selling firewood. I harvest enough food for my family although I do not get much to sell but I feel comfortable that I have enough food." *[Female headed beneficiary with access to coupons in 3 seasons, Blantyre].*

"I have enough food and peace inside of me because I am assured that my grandchildren have something to eat. Other than that, there is no other manifestation of the impact of the subsidy." *[Widow beneficiary with access to subsidy since 2005/06 (6 seasons), Blantyre].*

"I used to grow tobacco and buy commercial fertiliser before the subsidy programme. The major impact of the subsidy programme is that we are able to harvest enough food that run to next harvest and also sell some of it because we have surplus. Nowadays, we no longer go for ganyu work in other people's farms to get good" *[Married (69 year old) male head with access to subsidy in 6 seasons, Kasungu].*

"There has been some change since the amount of food I have been harvesting for the past five years; this is due to access of fertiliser although the amount is very little for one to see. Without the subsidy I could only manage to harvest 2 ox-carts from a 1 acre field of maize (that is before 2005/6) but now at least I can get 3 ox-carts of maize" *[Married (32 years old) male head with access to subsidy in 1 season, Lilongwe].*

"I used to buy commercial fertiliser before subsidy and the year I did not receive coupons I bought commercial fertiliser. With respect to the impact of the subsidy programme, it has helped me in bringing food on my table. Without subsidy I think I would have been a tenant somewhere by now. Just imagine by the end of sales of 2006/07 I bought another bicycle, dining set and a radio out of the money earned through the subsidised fertiliser" *[Married (31 year old) male head receiving 2 coupons in 4 seasons, tobacco farmer, Mzimba].*

"Prior to the subsidy we used to buy fertiliser on credit, but we have been benefiting from the subsidy since it started in 2005/06. The major impact of the subsidy programme in all the years that my household has been benefiting is that we harvest enough food which runs up to next harvesting period. We also sell the surplus and earn money that we use to buy commercial fertiliser although its one or two bags only" *[Married (78 year old) male head with access to subsidy in 6 seasons, Mzimba].*

"The subsidy programme has really changed my life because I never go to bed hungry since prices of food have gone down. I am at least living a healthy life since ganyu prices have increased and I am able to earn K400 a day when I do ganyu" *[Married (38 year old) female with access to subsidy in 3 seasons, Thyolo].*

Appendix Box 2 Selected limited impact life stories from the subsidy programme

"The 2007/08 season was a set back again owing to sharing of coupons compared to the receipt of one coupon per household. We no longer receive one coupon for each household alone and that was slowly walking us back down to the path we had been rescued from life of food in sufficiency – painful life" *[Female head and widow with access to coupons in 6 seasons, Lilongwe]*.

"I have not seen real change in my life since 2005/06 season. I am as poor as I was in 2004/05 season. Subsidy fertiliser is not adequate as I have been getting 1 bag or sharing 1 bag with another household and in 2010/11 season I shared 1 bag with another villager. I am still failing to produce enough for my own consumption. If I had access to 2 bags each year I could have improved my life" *[Female head and divorced with access to coupons in 5 seasons, Kasungu]*.

"Since 2005/06 and 2009/10, I experienced so many changes in my welfare because of the introduction of the subsidy program. In 2005/06 I received two fertiliser coupons and 2kg of hybrid seeds. During that season, I harvested ten 50kg bags of maize and had enough food throughout the year. However, in 2007/08 I received one fertiliser coupon (25kg of 23-21-0 and 25kg of Urea) and harvested only two 50kg bags of maize. As a result, the food ran out after three months only." *[Married female beneficiary with access to subsidy in 4 seasons, Blantyre]*

"The harvest has never been enough since 2006/07 season. The maize we have been harvesting has never gone past the month of January. We depend on ganyu to survive. I have not really seen the real impact of subsidy on our household. The 1 bag of fertiliser we are benefiting from this programme we could afford to buy even before subsidy. Even if this programme is to end I think we can still afford to buy a single bag of fertiliser, only what my husband has to do is to stop drinking beer" *[Married (35 year old) female with access to subsidy in 6 seasons, Mzimba]*.

"The inputs subsidy programme has not yet had a positive impact on my life due to old age. In 2009/10 season I only managed to harvest 5 bags of maize weighing 50 kg from the 2 bags of subsidised fertilisers that I got" *[Married (81 year old) male head with access to subsidy in 2 seasons, Thyolo]*.

"Things did not just turn around immediately but the period we usually spend on ganyu is gradually being reduced. We are now able to keep maize nearly throughout the season without much ganyu on other people's farms. Noting much of a change except slightly higher maize stock levels and a little saving which also ends up in buying the subsidised inputs" *[Married female with access to subsidy in 6 seasons, Ntcheu]*.

"Now I harvest 2 – 3 bags of maize and this maize is not enough for my family. However, the subsidy has still helped my food security" *[Widow (60 years old) female head with access to subsidy in 2 seasons, Phalombe]*.

END NOTES

1 However, these figures reflect receipt of subsidized fertilizers and do not account for the quantity received and the last time they received for those that received less than six times.

2 Panel data on education and health are only available from IHS2 and the 2010/11 FISS and the panel analysis is based on two periods.

3 It is not clear why maize prices rose in 2008/9 – and without apparent hardship for the poor – probably due to a combination of rising ganyu wage rates and disruption of a thin market by official export of over 300,000MT of maize in late 2007 when it was thought that maize stocks were higher than they actually were (Dorward and Chirwa, 2011).

4 The average exchange rate in 2010 was MK150=1 US Dollar.

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